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# Digital Mapping, Charting, and Geodesy Analysis Program: Technical Review of MATT Performance Specification

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The MATT Performance Specification being reviewed is similar to the Digital Nautical Chart (DNC) and Tactical Ocean Data (TOD) specifications, with specific Chief of Naval Operations (CNO) Special Chart features added for submarine navigation support data, and is specifically intended to support the U.S. Navy requirements for subsurface digital navigation data to support the Navigation Sensor System Interface (NAVSSI). MATT portrays strategic information in support of naval operations. The MATT is based on the feature content of the hardcopy Harbor, Approach, Coastal, and General charts and on the DNC, both produced by NIMA and augmented by additional information.

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# DMAP Technical Review of

# MATT Performance Specification

## Background

The MATT is similar to the Digital Nautical Chart (DNC) and Tactical Ocean Data (TOD) specifications, with specific Chief of Naval Operations (CNO) Special Chart features added for submarine navigation support data and is specifically intended to support the U.S. Navy requirements for subsurface digital navigation data to support the Navigation Sensor System Interface (NAVSSI). MATT portrays strategic information in support of naval operations. The MATT is based on the feature content of the hardcopy Harbor, Approach, Coastal and General charts and on the DNC, both produced by NIMA, augmented by additional information.[1]

## General Remarks

When we first received MATT for review we were puzzled as to exactly what MATT was. The acronym MATT could not be deciphered. The body of the specification looked very similar to DNC with a noted exception of one sentence that indicated "MATT is a vector based digital product designed to support subsurface marine navigation and Geographic Information System (GIS) applications". Subsequently we received additional information answering some of our initial questions.

For the sake of clarity, a change in the name of the specification to something more meaningful would be desirable.

At the present time it is unclear to DMAP what the current thinking is in relation to the TOD family of products and how MATT fits with the current plan.

**Table 1. Product Intended Use**

| |
|---|
| **MATT - Support electronic chart display systems. Designed to support subsurface marine navigation and GIS applications. It can be used as a background display for other geographic data.** |
| **DNC - Portrays selected maritime significant physical features in a format suitable for computerized marine navigation.** |
| **TOD0 - Supplement electronic chart display systems with Limited Distribution information portraying Naval Operating Areas, Ranges, and Exercise areas.** |
| **TOD1 - Supplement electronic chart display systems with detailed classified depth information to permit the safe underwater navigation of submarines.** |
| **TOD2 - Supplement electronic chart display systems with detailed classified depth information to permit the safe underwater navigation of submarines.** |
| **TOD3 - Specification not drafted at this time.** |

[1] MIL-PRF-XXXXX, Draft NIMA MATT Vector Product Performance Specification, 19 October 2000.

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| |
|---|
| **TOD4 - Supplement the electronic chart display systems with detailed classified depth and other information to permit the safe surface and underwater navigation and operation of submarines and their escorts during submarine hull integrity tests.** |
| **TOD5 - Specification not drafted at this time.** |
| **TOD6 - Specification not drafted at this time.** |

## Changes to DNC reflected in MATT

Three attributes were contained in MATT that are not currently specified in the Feature and Attributes Code Catalog (FACC). Table 2 lists these attributes and their possible values.

Table 2. Attribute Codes Added by MATT **NOT** in FACC

| Attribute Code | Description | Values |
|---|---|---|
| CNO | CNO Special Graphics Category | 1 – Not a CNO Special<br>2 – CNO Special |
| MDB | MIDB Database Number | N/A – Null, CNO=1<br>Text string – CNO=2 |
| CLS | Sounding Classification | 1 – Unclassified<br>2 – Classified<br>3 – Side-scan sonar data<br>999 - Other |

In addition to these three attributes, the possible values of several existing attributes were expanded. These values are contained in Table 3.

Table 3. Values in Existing Attributes Added by MATT **NOT** in FACC

| Attribute Code | Description | Added Values |
|---|---|---|
| HDI | Hydrographic Depth / Height Information | 7 – Sonar other than side-scan<br>8 – Side-scan Sonar |
| RAS | Radar Station Classification | 3 – Missile<br>4 – Anti-Aircraft<br>5 – Early Warning |
| BST | Boundary Status Type | 5 – Recognized by the producer<br>6 – Not recognized by the producer |
| HGT | Height Above Surface Level | 0 - Unknown |

In view of the high degree of similarity of MATT with DNC, two other possibilities might be considered:

1) Modify the DNC specification to include added features of MATT (e.g., CNO, CLS, MDB), or
2) Formulate MATT as a supplemental product to augment existing DNCs (i.e., a Mission Specific Data Set).

Either of these two choices would eliminate what appears to be a somewhat redundant specification. It is presumed that the production of a classified product might be facilitated by the current MATT specification. However, the MSDS (supplemented coverages) concept should also offer the same advantages for classified production.

## Comparison with current paper product

Two paper charts were briefly reviewed for data content, symbology, typography, and marginal notes. From the two charts reviewed it can be concluded that the current MATT specification is sufficient to capture the cartographic content. However, several reservations remain.

The two charts reviewed relied heavily on text in denoting placenames, physiographic features, and high-density soundings. Commonly used computer monitors lack the resolution afforded by quality lithography. Consequently information displayed to the user must be done using larger characters (e.g., text or symbols) than what you would see on paper. This is necessary to maintain legibility and low ambiguity for the text and symbols. However, in doing so the geographical extent of the screen must be reduced to prevent excessive symbol overlap. This reduction in geographic extent leads to a loss of context and diminished cartographic effectiveness. The charts examined exhibited high sounding density resulting in high text density. This may result in a decrease in effectiveness when displayed on a computer monitor via MATT.

Another possible problem is with type placement. Both charts exhibited high density of textual information. The placement of geographic feature names and notations were performed by a skilled hydrographer/cartographer. The currently available automatic type placement methods used in GIS/ECDIS unfortunately are inadequate. This inadequacy leads to poor cartographic communications and a loss of effectiveness for the chart.

While MATT is adequate to contain the information content needed, the current display systems may fail to display it in a workable fashion.

It is also our understanding that other charts in the series may contain extensive marginal notations and possibly insets. Textual information blocks and/or insets are not handled adequately by VPF and consequently will not function to expectations in MATT.

## Symbology

The feature attributes added by MATT to DNC will need to be addressed from the standpoint of symbology. GeoSym 4 does not currently support these attributes. Additionally, alternative symbology of sounding display may need to be addressed to support the MATT product. Since symbology is not a part of the MATT specification, this issue is not addressed in detail in this review, but is noted here as a potential area of interest for further consideration.

## Editorial Comments

Only two very minor typographic errors were noted during the review of the specification and are only mentioned as a side note. These are noted in Table 4.

Table 4. Editorial Notes (Suggested changes):

| Specification Location | Editorial Note | Correction |
|---|---|---|
| Pg. 67, top of page | f. ... CD Number, i.e., 016 . | Remove extra spaces before and after 016. |
| Throughout Appendix A | CNO Special Graphics Category . | Remove the space before the period on each description of CNO Special Graphics Category. Add space after period. |

## Recommendations

1. Give consideration to producing a supplemental coverage to DNC rather than a modified DNC (i.e., MATT).
2. Change the name MATT to something more related to the product function.
3. Improve handling abilities for the much used marginal notations and insets.
4. Improve symbolization, especially for dense areas.
5. Request FACC changes shown in Tables 2 and 3 are formally requested through chain to DIGEST committee.
6. Correct minor editorial suggestions shown in Table 4.

## Summary and Conclusion

The MATT specification appears to be adequate to contain the information presently used in subsurface navigation charts. However, due to the current limitations in computer monitors and automatic text placement, the utility of MATT may be less than desired.

## Acknowledgments

The Oceanographer of the Navy (N096) funded this effort to evaluate the MATT Performance Specification under the direction of LCDR Karen Ruppe. This evaluation, and funded under Program Element 0603704N, is a part of the Naval Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) long-term focus of enhancing the Navy's use and development of digital MC&G technologies. DMAP greatly appreciates the ongoing efforts of Dr. Edward Mozley, SPAWAR Program Manager.